

Hydrological response in a highly urbanized watershed in China

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Abstract

Urbanization has a strong signal on the hydrologic cycle, leading to reduced infiltration, and faster and larger runoff. However, less is known in watersheds that have been experiencing such a large and rapid urbanization as those in China. Here we focus on the Wenyu watershed, a fast urbanizing basin located in the Beijing metropolitan area. Using a statistical attribution framework, we examine the hydrological response to the increasing urbanization across a wide range of discharge quantiles, from low to high flows; moreover, we perform analyses at the seasonal scale to capture differences in the physical processes at play during the year. In addition to impervious areas, we also consider precipitation, temperature, antecedent wetness, recycled water amount, and groundwater level as potential predictors. Results indicate that our models can capture well the variability in streamflow in this highly urbanized basin. Overall, urbanization played a different role for the different seasons and discharge quantiles. More specifically, we find its strongest impact to be in winter and spring, and for low and median quantiles. The role of precipitation is the strongest in summer, and it increases as we move towards the upper tail of the discharge distribution. Recycled water, on the other hand, tends to play a more dominant role in winter and spring.

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